



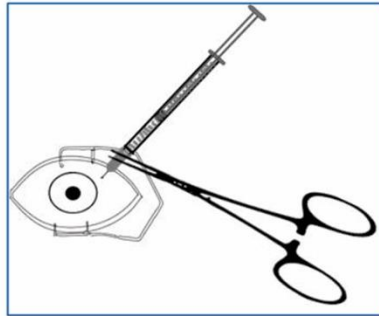
2016

# TREATMENT PROTOCOL

For Postoperative Endophthalmitis

2<sup>nd</sup> Edition

## CONCISE GUIDELINES TO MANAGE Postoperative Endophthalmitis



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Treatment protocol for postoperative endophthalmitis.



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## DEDICATION

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*"I dedicate this book to Dr. Tariq Saeed MD DABO  
and Professor Wasif M Kadri FRCS, FCPS."*

Words cannot express my gratitude to my mentor Dr. Tariq Saeed for the training he imparted, his professional advice and supervision in the development of my career as an ophthalmologist. It was he who introduced us to the world of modern ophthalmology in the early nineties at LRBT Eye Hospital. I always remember my first research project on "Treatment of endophthalmitis with intravitreal injections." The research paper was presented ultimately in Lahore Ophthalmology 1996. He was there in this project right from providing the data, drawing the graphics and revision of the manuscript. I always remember and cherish the rehearsing sessions in the TV lounge of his house. He would thoroughly explain how to choose the words, how to express them, and how to engage the audience. Then he would deliver the whole speech in front of me and ask me to do the same. I cannot say exactly how many times we rehearsed in this manner. It was my first ever presentation at an international



meeting. The result was that it was declared to be one of the best papers of the year 1996, and I got the gold medal for that. He is there to date with all the affection, kindness, and love for his disciples and ophthalmology. May Allah bless him with best of the rewards here and the hereafter.

Professor Wasif M Kadri marhoom had been more than a teacher to me. His fatherly figure was there to coach, supervise and educate me from undergraduate years at Allama Iqbal Medical College Lahore. It was he who helped me to fall in love with ophthalmology. He was graciously kind to let me interact with Dr. Tariq Saeed for my research projects and presentations. My association with this great personality lasted for more than quarter of a century until his death in December 2014. He was an exemplary and visionary person who dedicated his life to the service of humanity.

Dear Sir, "Thank you for the great skills and knowledge you have imparted to me. You left fingerprints of grace on our lives. You shall never be forgotten".



Treatment protocol for postoperative endophthalmitis.

واصف و طارق سے عالم ٹھہرے اس کے راہبر  
مظہر بھی لوگوں کی نظر میں ہو گیا ہے معتبر  
میں کہ اک بندہ عِ عاجز، ہوں بہت ہی بے ہنر  
جو بھی اچھا مجھ میں دیکھو، بس انہی کا ہے اثر



## PREFACE

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This booklet provides concise guidelines for evaluation and treatment of post-operative endophthalmitis. It comprehensively explains to the eye specialists what to expect, when to intervene and what to offer when expecting and dealing with post-operative endophthalmitis. It also gives information about the medicine to be used and how to avoid the complications during and after the treatment.

The author presented his first ever international research paper on "Treatment of endophthalmitis with intravitreal injections" during "Lahore Ophthalmo" 1996. The presentation was highly appreciated. The scientific committee awarded Gold Medal 1996 to the author. The idea to prepare these guidelines was floated by two pioneers in ophthalmology namely Professor Raja Mumtaz and Dr. Mohammad Yaqin Sb. The first edition was printed and distributed free of cost amongst Pakistani Ophthalmologists in 1998. Grin publishers Germany published the E-book later on.



Though much has not changed regarding endophthalmitis therapy. Still, we need to revise and take the redundant things out. The manuscript has been thoroughly revised and updated according to modern well-established endophthalmitis protocol. New sections like pretest and posttest, concise pharmacology, inoculation and submission, preservation of anatomical integrity and prevention of endophthalmitis have been added.

The focus is on keeping it concise and handy and a ready reference in busy practices. A section of further reading at the end is there for the readers interested in deeper and detailed insight into the subject. We intend to make it available in EBook and Android formats as well.

The readers especially the residents, are encouraged to take the pretest and record the responses on the given response sheet at the end of the pre-test. They can go through the booklet and elaborate their understanding by reviewing the carefully chosen "Further reading" section. They can take the post-test at the end and compare it with their pretest response sheet. The answers to the test with comments are also provided at the end.





I hope this little effort will contribute towards better understanding of diagnosis and intervention in cases of postoperative endophthalmitis

Sincerely,

**Dr. Mazhry**



## ACKNOWLEDGEMENTS

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I would like to express my gratitude to the many people who saw me through this book; to all those who provided support, talked things over, read, wrote, offered comments, allowed me to quote their remarks and assisted in the editing, proofreading and design.

I would like to thank my seniors Dr. Khurram Azam Mirza and Dr. Shahid Aziz Sheikh for helping me in the process of proofreading and editing. Especially Dr. Khurram was very kind with his suggestions for few additions.

I would like to thank my brother Zia ul Mazafary, an engineer by profession, for going through this pure medical writing and coming up with valuable suggestions. Above all, I want to thank my wife and the rest of my family, who supported and encouraged me in spite of all the time it took me away from them.

Lastly, I apologize from all those who have been with me over the course of the years and whose names I have failed to mention.



Treatment protocol for postoperative endophthalmitis.

I am greatly indebted to Kobec Health Sciences for publishing and distribution of this booklet amongst Pakistani ophthalmologists.



## Disclaimer

*The author of this manuscript has made considerable efforts to ensure the information presented, is accurate and up to date. The recommendations contained in these guidelines do not indicate an exclusive course of action, or serve as a standard of medical care. Variations, taking individual circumstances into account, may be appropriate. Users of these guidelines are strongly recommended to confirm that the information contained within them, especially drug doses, is correct by way of independent sources. Treatment decisions must be made based on the independent judgment of physicians and each patient's individual circumstances. A guideline is not intended to take the place of physician judgment in diagnosing and treatment of a particular patient. The author accepts no responsibility for any inaccuracies, information perceived as misleading, or the success of any treatment regimen detailed in the guidelines. The readers are urged to seek out newer information that might impact the diagnostic and treatment recommendations contained within this booklet.*



*"Every eye is an eye, when  
you're doing the surgery  
there that is just as important  
as if you were doing eye  
surgery on the prime minister  
or the king."*

**Fred Hollows**



# Table of Contents

---

<b>DEDICATION.....</b>	<b>4</b>
<b>PREFACE .....</b>	<b>7</b>
<b>ACKNOWLEDGEMENTS .....</b>	<b>10</b>
<b>LIST OF FIGURES .....</b>	<b>16</b>
<b>LIST OF TABLES .....</b>	<b>16</b>
Objectives .....	18
<b>PRETEST .....</b>	<b>19</b>
<b>PRETEST RESPONSE SHEET.....</b>	<b>23</b>
<b>TREATMENT PROTOCOL FOR POSTOPERATIVE ENDOPHTHALMITIS.....</b>	<b>24</b>
<b>DIAGNOSIS AND MANAGEMENT PLAN FOR ENDOPHTHALMITIS.....</b>	<b>26</b>
<b>TAP AND INJECT, PPV AND VITREOUS BIOPSY .....</b>	<b>31</b>
<b>MANAGEMENT PLAN FLOW CHART .....</b>	<b>32</b>
<b>MICROBIAL DIAGNOSIS AND ANTIMICROBIALS .....</b>	<b>33</b>
<b>DOSES AND PREPARATION OF INTRAVITREAL INJECTIONS.....</b>	<b>34</b>



<b>PREPARATION OF INTRAVITREAL INJECTIONS .....</b>	<b>36</b>
<b>CHOICE OF ANTIMICROBIALS.....</b>	<b>39</b>
<b>CONCISE PHARMACOLOGY OF THE WIDELY USED INTRAVITREAL DRUGS .....</b>	<b>40</b>
<b>INSTRUMENTS ANESTHESIA AND INFORMED CONSENT.....</b>	<b>45</b>
<b>PROCEDURE AND TECHNIQUE .....</b>	<b>48</b>
<b>ANTERIOR CHAMBER TAP .....</b>	<b>56</b>
<b>INOCULATION AND SUBMISSION FOR THE LAB WORKUP .....</b>	<b>59</b>
<b>FOLLOW UP AND REPEAT INTRA VITREAL INJECTIONS .....</b>	<b>59</b>
<b>PRESERVATION OF THE ANATOMICAL INTEGRITY IN EYES WITH NO VISUAL OUTCOME.....</b>	<b>61</b>
<b>PROGNOSTIC SIGNS .....</b>	<b>61</b>
<b>COMPLICATIONS OF THERAPY.....</b>	<b>63</b>
<b>PREVENTION OF ENDOPHTHALMITIS .....</b>	<b>64</b>
<b>THE OUTCOMES AND CONCLUSION .....</b>	<b>65</b>
<b>FURTHER READING .....</b>	<b>67</b>
<b>POST TEST .....</b>	<b>69</b>



<b>TEST ANSWERS WITH EXPLANATIONS .....</b>	<b>74</b>
---	-----------

## LIST OF FIGURES

---

<b>FIGURE 1 – Endophthalmitis management plan flow chart...</b>	<b>25</b>
<b>FIGURE 2 – Prepared Intravitreal Injections.....</b>	<b>36</b>
<b>FIGURE 3 – Instruments for Intravitreal Injection .....</b>	<b>38</b>
<b>FIGURE 4 – Intravitreal Injection Technique .....</b>	<b>40</b>
<b>FIGURE 5 – Intravitreal Injection Site.....</b>	<b>41</b>
<b>FIGURE 6 – Estimating Pars Plana distance from limbus.....</b>	<b>41</b>
<b>FIGURE 7 – Vitreous Aspiration and Injection Part-A .....</b>	<b>42</b>
<b>FIGURE 8 – Vitreous Aspiration and Injection Part-B.....</b>	<b>43</b>

## LIST OF TABLES

---

<b>TABLE 1 – Commonly used drugs and their dose for intravitreal injection .....</b>	<b>27</b>
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**TABLE 2** – Preparation of required dose of intravitreal injections in 0.1ml volume-----29

**TABLE 3** – Preparing the final Intravitreal Injection dose in 0.05ml -----30



## Objectives

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AFTER COMPLETION OF THIS BOOK, THE READER WILL BE ABLE TO:

- Anticipate and plan the required intervention when faced with postoperative endophthalmitis.
- List the risk factors associated with postoperative endophthalmitis
- Classify and describe the different drugs and their combinations used to treat endophthalmitis.
- Choose the appropriate antibiotic to treat postoperative endophthalmitis.
- Prepare the recommended dose and perform intravitreal injections independently.
- Obtain and inoculate the vitreous and aqueous samples at the time of intravitreal injection.



## PRETEST

---

1. Which of the following measures has been shown to reduce the incidence of endophthalmitis following cataract surgery?
  - a. The addition of gentamicin to the intraocular irrigating solution during cataract surgery.
  - b. Instillation of 5% topical povidone-iodine during presurgical preparation of the eye
  - c. Treatment of blepharitis with hot compresses, lid hygiene, and antibiotic one week before cataract surgery
  - d. Keeping the eyelashes out of the field, using a plastic adhesive drape.
2. All of the followings are involved in endophthalmitis except?
  - a. Retina
  - b. Vitreous
  - c. Sclera
  - d. Uvea



3. Organism most commonly implicated in late onset endophthalmitis after cataract surgery is?
  - a. *Pseudomonas aeruginosa*
  - b. *Staphylococcus epidermidis*
  - c. *Candida albicans*
  - d. *Propionibacterium acnes*
4. After 48 hours of a cataract extraction operation, a patient complained of ocular pain and visual loss. On examination, this eye looked red with ciliary injection, corneal edema, and absent red reflex. The first suspicion must be:
  - a. Secondary glaucoma.
  - b. Anterior uveitis.
  - c. Bacterial endophthalmitis.
  - d. Acute conjunctivitis
5. Intravitreal injection may be performed in aphakic eyes:
  - a. 4.5 mm posterior to the limbus
  - b. 3.5 mm posterior to the limbus
  - c. 5.5 mm posterior to the limbus
  - d. 2.5 mm posterior to the limbus



6. While entering the needle into the eye for vitreous aspiration and intravitreal injections, the tip of the needle is directed towards the:
  - a. Centre of the pupil
  - b. Centre of posterior capsule
  - c. Centre of the vitreous cavity
  - d. Centre of cornea
7. The volume of the intravitreal injection which can be injected without aspiration of the vitreous or AC tap is:
  - a. 0.05 ml
  - b. 0.15 ml
  - c. 0.25 ml
  - d. 0.35 ml
8. If indicated, the recommended vitrectomy procedure in acute endophthalmitis is:
  - a. Membrane peeling PPV
  - b. Cortical vitrectomy PPV
  - c. Anterior Vitrectomy PPV
  - d. Core vitrectomy PPV
9. In eyes with endophthalmitis, having no perception of light:



- a. Regular protocol of endophthalmitis treatment may be followed to save the anatomical integrity
  - b. No intravitreal injection may be offered, and enucleation may be advised.
  - c. Evisceration of the intraocular contents is the only choice
  - d. Only topical treatment may be advisable as the visual outcome is highly guarded
10. In cases of endophthalmitis, the probability to find a microorganism is higher in:
- a. Aqueous Samples
  - b. Tear lake samples
  - c. Corneal samples
  - d. Vitreous samples



**PRETEST RESPONSE SHEET**

1	2	3	4	5
6	7	8	9	10



# TREATMENT PROTOCOL FOR POSTOPERATIVE ENDOPHTHALMITIS

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## INTRODUCTION

Endophthalmitis is a devastating complication of ocular surgery and trauma, which may lead to total loss of vision and sometimes even the eyeball.<sup>1,2</sup> Postoperative endophthalmitis is an inflammatory condition of the eye, presumed to be due to an infectious process from bacteria, fungi or, on rare occasions, parasites that enter the eye during the perioperative period.<sup>3,4</sup> Management of endophthalmitis presents one of the most challenging problems in ophthalmology. Two third of all cases of endophthalmitis occur after surgery. 90% are caused by bacteria and the remaining 10% by fungi, viruses, and parasites. Incidence reported in the literature is 0.1% to 0.4%. Though no study is available locally, incidence in our setup seems to be even higher.





Traditionally endophthalmitis had been treated with topical and systemic antibiotics given both orally as well as parenterally but with a poor therapeutic response. Another mode of treatment that has become the standard treatment for endophthalmitis is an intravitreal injection of antimicrobials. Studies have proven this to be an effective, probably the only effective treatment available so far.

The authors carried out a study on 56 eyes diagnosed as cases of endophthalmitis.<sup>5</sup> The patients were treated with intravitreal injections. Results were encouraging. Anatomical integrity was preserved in 90% of cases and 60% had a visual acuity of 6/60 or better. A gold medal winning paper was presented by one of the authors in Ophthalmo 96 based on the above study. Great enthusiasm was shown about the technique. The Chairman of the conference advised publishing the technique.<sup>5</sup>

Endophthalmitis Vitrectomy Study (EVS) was completed in 1995. It had a great impact on endophthalmitis management recommendations. The study standardized the protocol of post cataract surgery endophthalmitis.<sup>6</sup>



The aim of this booklet is to present in a simple way for management of endophthalmitis using the technique of intravitreal injections. Secondly, we want to decrease the undue hesitancy and fear about the use of intravitreal injections. By the end of the booklet, the reader will feel confident to practice the procedure on his own whenever and wherever needed.

## DIAGNOSIS AND MANAGEMENT PLAN FOR ENDOPHTHALMITIS

---

### RISK FACTORS

- Suspect in any eye with inflammation greater than the usual post op course
- Wound leak or dehiscence, especially a leaking small Phaco cataract surgery wound.
- Suture abscess
- Vitreous incarceration in the wound
- Eroding scleral sutures used to fixate IOLs

### EARLY SYMPTOMS



- Slight to no pain.
- The decrease in visual acuity, which may be the only symptom.
- Floaters

### *Important*

*While explaining to the patients after cataract surgery, the instructions need to be phrased carefully. One needs to tell the patient that vision is going to improve day by day and any deterioration after initial improvement must be taken seriously and immediately reported to the surgeon.*

## LATE SYMPTOMS

- Severe pain.
- Redness
- Marked visual loss.
- Lid edema.

## EARLY SIGNS

The patient may present with minimal signs. Anterior chamber may be clear. Cells in vitreous may be the only finding on examination. This finding alone is sufficient to diagnose endophthalmitis in an appropriate setting. One must have a routine look into the vitreous during the



postoperative examination, as already mentioned; the patient might be symptom-free.

## LATE SIGNS

- Markedly reduced vision
- Lid edema.
- Chemosis.
- Corneal haze.
- Hypopyon.
- Cells in the vitreous.
- Absent red reflex.

### *Important*

*The recognition of early symptoms and signs is the most important thing in the treatment of endophthalmitis. Late symptoms and signs neither mean that we should wait till the condition is established, nor it means that the condition has become untreatable.*

---

### ENDOPHTHALMITIS VITRECTOMY STUDY (EVS)<sup>7</sup>

EVS evaluated only the patients with acute endophthalmitis occurring within six weeks of cataract surgery or secondary intraocular lens implantation.



### SYMPTOMS:

94.3% reported blurred vision

82.1% red eye

74% pain- It is important that almost 25% patients did not have pain.

34.5% swollen lid

### SIGNS:

85% hypopyon- Fifteen percent patients may not have pain.

79% hazy media

26% PL vision only

When there is doubt between post-operative inflammation and endophthalmitis with severe haze in the ocular media or vitreous opacities, clinically the possibility of an infection should be given priority.

## ULTRASOUND EVALUATION

Should be performed if significant media opacification prevents adequate view of the fundus. One should look for, dispersed vitreous opacities with vitritis, Chorioretinal thickening. One needs to rule out, RD or choroidal



detachment, dislocated lens material, and retained foreign bodies. Retinal or choroidal detachment are poor prognostic factors.



## TAP AND INJECT, PPV AND VITREOUS BIOPSY

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- The EVS study recommendation shows if the vision is HM or better, use the tap and inject technique. The study further recommends that If the vision is light perception or worse, a pars plana vitrectomy is indicated. Aqueous and vitreous cultures are taken, and intravitreal antibiotics are injected at the time of surgery.
- Our experience, however, is to consider pars plana vitrectomy if we are not able to aspirate the vitreous with a 23G needle, assuming that the vitreous abscess is too thick to be aspirated. It will not only provide the vitreous biopsy but also creates a central core for proper circulation of injected antibiotics and future intravitreal injections. By vitrectomy, we mean a core vitrectomy and the case should be referred to an expert posterior segment surgeon.
- Since the availability of trocars and suture less vitrectomy, some experts advocate vitreous biopsy with the help of a vitreous cutter. As they say that needle aspirates can cause traction, hole, and sub retinal abscess formation. It



Treatment protocol for postoperative endophthalmitis.

is safer with the vitreous cutter. However, this procedure may be undertaken by an ophthalmologist with proper training for such procedures.

## MANAGEMENT PLAN FLOW CHART

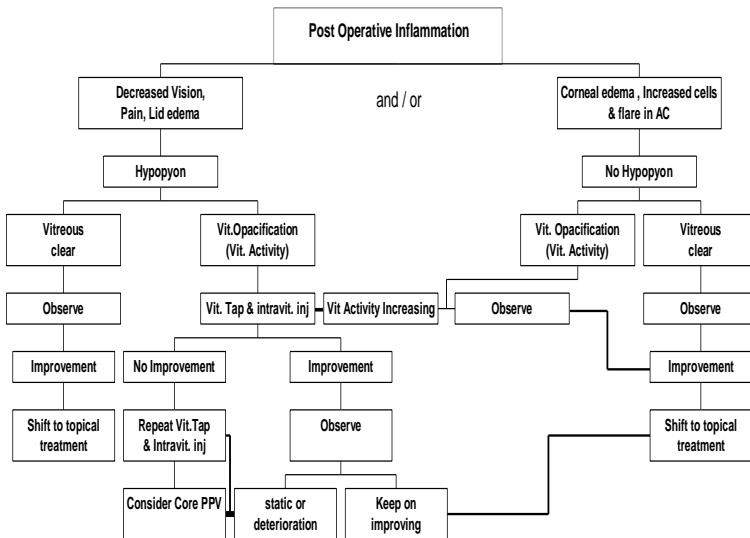


FIGURE 1-Endophthalmitis management plan flow chart.





# MICROBIAL DIAGNOSIS AND ANTIMICROBIALS

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## MICROBIOLOGICAL DIAGNOSIS

As soon as the diagnosis of endophthalmitis is suspected, the first maneuver to be done is to obtain a vitreous sample to find the causal microorganism.<sup>1</sup> A sample of aqueous humor may be useful also, but the priority is to get some vitreous aspirate. It may be performed by a simple tap, biopsy or vitrectomy. The probability to find a microorganism is indeed higher in the vitreous as compared to the aqueous humor. The bacterial flora and the choice of antibiotics are discussed in the following section. It is recommended to perform the first injection of broad spectrum antimicrobial at the first tap. However, the choice of antibiotics in following intravitreal injections may be according to the reported lab work up.



## DOSES AND PREPARATION OF INTRAVITREAL INJECTIONS

**TABLE-1** - Commonly used drugs and their dose for intravitreal injection

ANTIBACTERIAL AGENTS		
<u>Drug</u>	<u>Dose</u>	<u>Spectrum</u>
Vancomycin	1 mg	Resistant Staph.
Ceftazidime	2 mg	Mainly G-ve. Especially against Pseudomonas.
Amikacin	400 µg	Mainly G-ve.
Cefazolin	2.25 mg	Broad spectrum, mainly G+ve.
Kanamycin	300-500 µg	Mainly G-ve.
Gentamycin	200 µg	Mainly G-ve.
Lincomycin	1.50 mg	Mainly G +ve.
Oxacillin	0.5 mg	Resistant Staph.
Tobramycin	200-400 µg	Broad spectrum,



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		mainly G-ve.
Carbenicillin	2 mg	G-ve. Especially against Pseudomonas.
Moxifloxacin	400 µg	
<b>ANTI-FUNGAL AGENTS</b>		
<b>Fluconazole</b>	50 µg	
<b>Amphotericin B</b>	5-10 µg	
<b>Voriconazole</b>	100 µg	
<b>STEROIDS</b>		
<b>Dexamethasone</b>	400 µg	

*The final injectable dose is prepared in 0.1cc of ringer's lactate. However, it can be prepared in 0.05cc as well if vitreous, and AC tap aspiration is not adequate for 0.3-0.4 cc of injection volume.*



# PREPARATION OF INTRAVITREAL INJECTIONS

TABLE 2 - Preparation of required dose of intravitreal injections in 0.1ml volume.

Generic name	Trade name	Original strength	Amount taken	Ringers to be added	To make	Final Volume to be used
Vancomycin	Vancocin	500mg/5ml	0.1cc=10mg	0.9ml	1.0ml	0.1ml=1.0mg
Ceftazidime	Fortum	500mg/5ml	0.1cc=10mg	0.4ml	0.5ml	0.1ml=2mg
Amikacin	Amika	40mg/ml	0.1cc=4000µg	0.9ml	1.0ml	0.1ml=400µg
Dexamethasone	Decadran	4mg/ml	0.1cc=0.4mg			0.1ml=400µg
Voriconazole	Vfend	200mg/10ml	0.05cc=1000µg	0.95ml	1.0ml	0.1ml=100µg
Fluconazole	Diflucan	2mg/ml	0.1cc=200µg	0.3ml	0.4ml	0.1ml=50µg



**TABLE 3** - Preparing the final Intravitreal Injection dose in 0.05ml.

Generic name	Trade name	Original strength	Amount taken	Ringers to be added	To make	Final Volume to be used
Vancomycin	Vancocin	500mg/5ml	0.1ml=10mg	0.4 ml	0.5ml	0.05ml=1.0mg
Ceftazidime	Fortum	500mg/5ml	0.2ml=20mg	0.4 ml	0.5ml	0.05ml=2mg
Amikacin	Amika	40mg/ml	0.1ml=4000µg	0.4 ml	0.5ml	0.05ml=400µg
Voriconazole	Vfend	200mg/10ml	0.1ml=2000µg	0.9 ml	1.0ml	0.05ml=100µg
Fluconazole	Diflucan	2mg/ml	0.2ml=400µg	0.2 ml	0.4ml	0.05ml=50µg



Injections should be prepared just before use. Leftover quantity can be used to make fortified eye drops.

- Distilled water is required for the constitution of vials. BSS/Ringer's Lactate/Saline is used for dilutions
- Expiry for the constituted vial is one week or as specified by the manufacturer if distilled water is used.
- Discard the dilutions after a single use.
- The air bubble is used as a churner to mix by floating it up and down inside the syringe.
- A few taps or flicks with the fingernail allows any bubbles to float to the top. The plunger can then be raised to the 0.1 cc mark so that the desired volume to may be injected, is ready.
- The final prepared dose of the agents to be injected is placed in 1cc. Syringes with 0.1 cc calibrations.
- 0.1 cc. of Vancomycin (1mg/0.1mL) for injection into the vitreous needs to be kept in a separate syringe as it precipitates, if mixed with others.



- The final dose of Ceftazidime, Amikacin, and dexamethasone may be placed in the same syringe for convenience.

## CHOICE OF ANTIMICROBIALS

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- Time of onset gives some clue to the type of organism.
- Staph aureus and gram-negative organisms usually present between first and third postoperative days with severe symptoms and signs.
- Staph. Epidermidis usually presents with mild signs between fourth and tenth postoperative days.
- Fungus presents around a third postoperative week, with mild signs.

While waiting for culture, the multi-drug regimen is used to help ensure that any bacteria present are killed. In other situations where no stain or culture or gram stain report is available an antibiotic combination which covers both gram



positive and gram negative organisms along with a steroid is used.

At the time the antibiotics of choice for intravitreal injection are Vancomycin, Ceftazidime, Cefazolin and Amikacin, the later depending on Penicillin allergy. According to the EVS, Vancomycin and amikacin empiric combination covered 99.4% of all infecting organisms.<sup>7</sup>

Many experts believe that Amikacin is toxic to the retina, and they advocate using Ceftazidime regardless of penicillin allergy.

However, although the basic technique for tap and inject may remain the same, the favored antibiotics may change in the future so the choice of antibiotics may then be based on peer-reviewed recommendations

## **CONCISE PHARMACOLOGY OF THE WIDELY USED INTRAVITREAL DRUGS**

---

### **VANCOMYCIN**

- Name derived from the word “vanquished.”





- Vancomycin inhibits cell wall synthesis in Gram + bacteria.
- Good coverage against Gram-positive bacteria and good MRSA coverage.

## CEFTAZIDIME

- Third generation cephalosporin.
- Broad spectrum activity against Gram positive and Gram negative bacteria.
- Active against *Pseudomonas aeruginosa*.
- It Inhibits mucopeptide synthesis in the bacterial cell wall.
- Usually bactericidal. Can be substituted for an aminoglycoside to reduce the risk of macular ischemia. However, coverage for gram-negative bacilli is incomplete with ceftazidime.<sup>8</sup>

## CEFAZOLIN

- First generation cephalosporin.
- Effective against Gram + bacteria.
- Affects bacterial cell

## AMIKACIN



Treatment protocol for postoperative endophthalmitis.

- Aminoglycoside, effective against Gram-negative bacteria.
- Interferes with the bacterium's ability to synthesize proteins vital to its growth.
- May also be synergistic with Vancomycin against certain Gram-positive organisms.

## VORICONAZOLE

- this drug is used when treatment for an intraocular fungus is needed.
- A second-generation triazole which is used for antifungal treatment. Inhibits ergosterol synthesis causing increased membrane permeability and inhibition of fungal growth.

## INTRAVITREAL COMBINATION EXAMPLES

Vancomycin + Ceftazidime+Dexamethasone

OR

Cefazolin+Amikacin+Dexamethasone

OR

Vancomycin + Amikacin+Dexamethasone

OR

Vancomycin+Cefazolin+Amikacin+Ceftazidime



Treatment protocol for postoperative endophthalmitis.

+ Dexamethasone

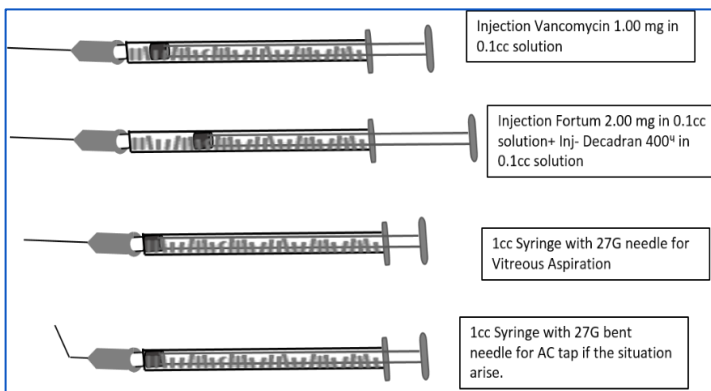
***Important***

*\*The steroid is used in a routine cover but must not to be used if a fungal infection is suspected.*

*\*All the antifungal drugs are very toxic and should not be used until there is a very strong suspicion or positive staining or culture report for the fungus.*



## Treatment protocol for postoperative endophthalmitis.



**FIGURE 2** -Prepared Intravitreal Injections



# **INSTRUMENTS ANESTHESIA AND INFORMED CONSENT**

---

## **INFORMED CONSENT AND RISKS OF INTRAVITREAL INJECTIONS**

Discuss the indications, risks, benefits, and alternatives with patients. Obtain informed consent and have the patient's signature on the consent form witnessed.

## **ANESTHESIA**

Anesthesia can be provided by a topical anesthetic, a peribulbar injection or a retrobulbar injection. In an individual with a lot of pain a retrobulbar would be indicated. Allow enough time to elapse for the anesthetic to take effect. One needs to be very careful as wound dehiscence is a risk if intraocular tension is raised due to peribulbar or retrobulbar injection.

Another option is to give the anesthetic agent subconjunctivally at the site of injection.



## THE INSTRUMENTS NEEDED FOR INTRAVITREAL INJECTION

1 x Tray

1 x Sterile drape

1 x Lid Speculum,

1 x St Martins Forceps

1x The Artery Forceps

1 x The Caliper

3 x Sterile Gauze

1x Eye Pad

6x1cc. syringes which have markings from 0.1 to 1.0 cc.



Treatment protocol for postoperative endophthalmitis.



**FIGURE 3 - Instruments for Intravitreal Injection**



## PROCEDURE AND TECHNIQUE

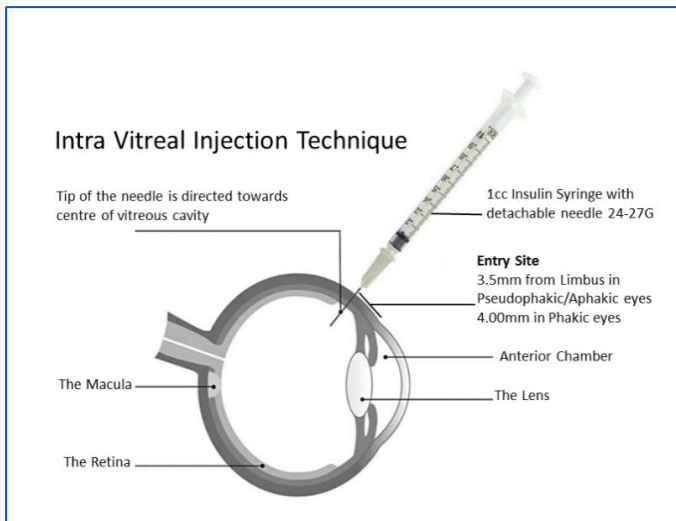
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### VITREOUS ASPIRATION AND INJECTION (TAP AND INJECT TECHNIQUE)

The tap is to remove material from inside the eye to identify the organism. Both the aqueous and vitreous might be tapped. Then inject to place antibiotics inside the eye. It is important to remember that the aspirations should precede the antibiotic injections. Injecting the antibiotics first could affect the ability to identify the infectious organisms. It is important to realize that there are institutional differences in this technique. I describe the Tap and Inject technique used by us over the last 20 years.

- Confirm that informed consent is obtained.
- Ideally, the patient should be lying on his/her back and be comfortable.
- It is helpful to use the magnification provided by a loupe or an operating microscope.



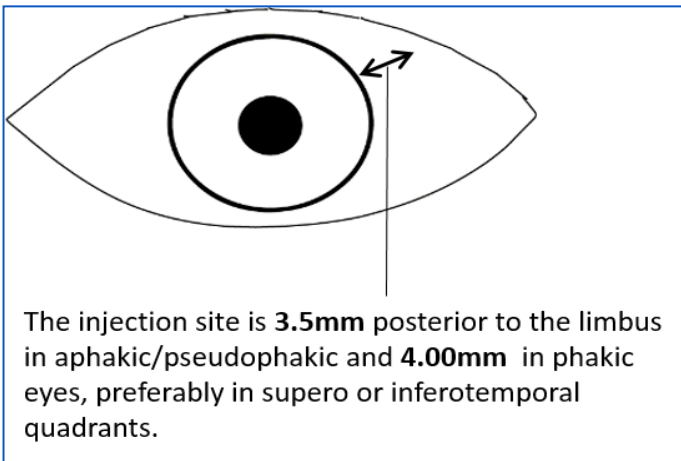


**FIGURE 4 -** Intravitreal Injection Technique

- Confirm the eye to be injected. One should avoid talking during injection.
- Place a speculum to separate the eyelids.
- Instill Povidone-Iodine (e.g. Betadine 5%) which is a sterile solution and is a broad-spectrum microbicide.
- The injection site is 3.5mm posterior to the limbus in aphakic and pseudophakic and 4.0mm posterior to the limbus in phakic eyes. (see Fig-5)

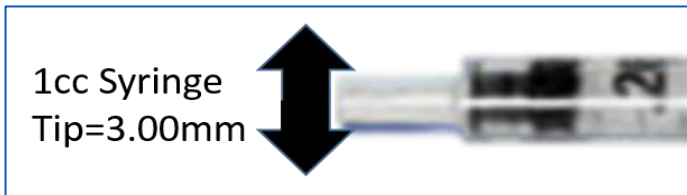


- Although the injection site could be in any of the four quadrants, the most popular one is supero or inferotemporal quadrants.



The injection site is **3.5mm** posterior to the limbus in aphakic/pseudophakic and **4.00mm** in phakic eyes, preferably in supero or inferotemporal quadrants.

**FIGURE 5-** Intravitreal Injection Site

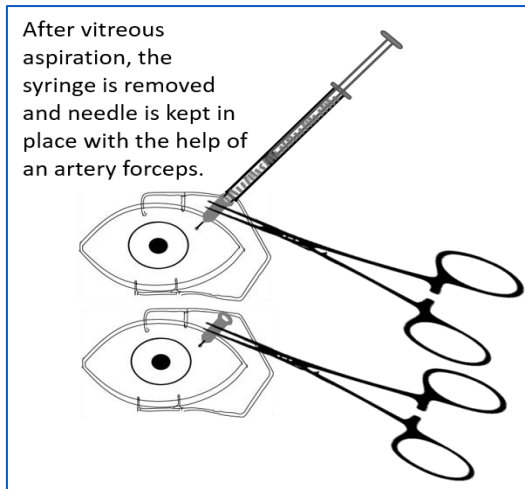


**FIGURE 6** - Estimating Pars Plana distance from limbus

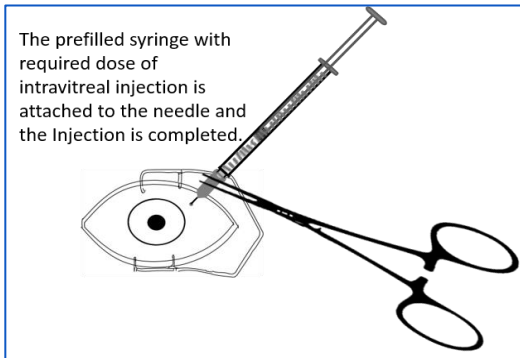
- To aspirate vitreous and give the injection, use a 1cc syringe with a detachable needle of size between 23G to 27G.
- The bigger gauge needle is required in younger patients and in cases where the vitreous abscess is thicker and difficult to aspirate.
- Make sure the plunger of the syringe moves easily by withdrawing and returning it a few times.
- Ask the patient to direct his gaze away from the site of needle entry.



- Mark the distance with preset calipers for the desired measurement. The tip of the syringe is 3 mm wide. It can be used to estimate the distance if the caliper is not available. (See Fig-6)



**FIGURE 7 -** Vitreous Aspiration and Injection Part-A



**FIGURE 8 -** Vitreous Aspiration and Injection Part-B

- Tip of the needle is directed towards the center of the vitreous cavity.
- Displace the conjunctiva away from entry site, so that conjunctival puncture does not override the scleral entry.
- The needle should pass through the pars plana avoiding the ciliary body and retina.
- Enter the eye quickly and firmly, keeping the insertion distance controlled. After entering, advance the needle slowly to the desired location.



- With the plunger fully inserted into the syringe, the needle enters the eye through the pars plana and is pointed toward the anterior vitreous. It is better not to place the entire needle within the eye. Leave some space between the hub of the syringe and the sclera.
- First, the vitreous is aspirated. The plunger is withdrawn to aspirate 0.2-0.4 ml of vitreous.
- If the first attempt to aspirate vitreous fails, the needle is withdrawn partially without removing it from the eye and it is then redirected to another area in the anterior vitreous. Even a 3rd or 4th attempt may be made by careful repositioning of the needle.
- If all the attempts to remove vitreous fail, the plunger should be returned to its original position and the needle and syringe kept in place. The same needle is to be used for intravitreal drug delivery after AC tap. It is recommended as it is not advisable to take fresh entry after AC tap into a soft eye.
- AC tap might be performed. The surgeon may use his other hand or ask his assistant for help.



- If the needle needs to be withdrawn at all, it is very important not to withdraw the needle while there is suction in the syringe. The vitreous tags or uveal tissue may be sucked into the needle and then pulled out of the eye, as the needle is withdrawn.
- One should never try to inject without aspiration. It is important to have reduced the intraocular pressure before the two intravitreal injections of 0.1 cc each. Otherwise, the intraocular pressure may become too high, and this may hurt the intraocular tissues and the already compromised incision wounds.
- If the vitreous is aspirated successfully, the syringe is removed holding the needle in place with some artery forceps. (See Fig-8)
- Now the syringe containing the antibiotic is attached to the same needle and injected.
- Some ophthalmologists prefer to inject through new sites which may have a better chance to self-seal. However, our recommendation is to use the same needle for injections.



### ***Important***

*\*All the steps are performed under sterile conditions using sterile ingredients and aseptic technique. The volume of each injection is 0.05 to 0.1cc. with total injectable volume in the range of 0.1 to 0.4cc.*

In cases where vitreous aspiration is not possible and we have to resort to AC tap, the final injectable volume should be kept as little as possible. It can be done by making each injection in a volume of 0.05cc instead of 0.1cc. One needs to follow the same guidelines mentioned in the table-2.

## **ANTERIOR CHAMBER TAP**

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- The AC tap is performed with a 27-30-gauge needle on a 1cc. syringe. The objective is to remove aqueous for culturing and this also lowers the intraocular pressure before the intravitreal injections.
- Make sure the plunger of the syringe moves easily by withdrawing and returning it a few times.
- The needle is bent as we prepare a cystotome, but tip remains untouched.





- Make sure the numbered side of the syringe is turned toward you before entering the anterior chamber. Do not let your fingers cover the numbers.
- Enter the eye at the limbus where there is a formed chamber. Always stay over the iris. Never the pupil.
- Tangential and long entry is made at the limbus, and 0.1-0.2cc of aqueous is aspirated.
- Make sure to keep the bevel of the needle turned anteriorly toward the cornea. It prevents the iris from being sucked into the needle as aqueous is being aspirated.
- Make sure the plane of the needle is parallel to the plane of the iris during insertion and while the needle is in the anterior chamber.
- The culture plates and slides may be inoculated as explained later.
- The intravitreal injection is completed through a preplaced needle as explained in the previous section.
- After the Tap and Inject procedure, an antibiotic ointment such as Neomycin, Polymyxin B Sulfate, and Dexamethasone is instilled on the eye and the speculum is removed and a patch placed over the eye



- The patient can remove the patch after 1-2 hours and resume the topical treatment as before.

## PRECAUTIONS

- Great care should be taken while preparing the injections. The low dose results in inadequate response whereas higher doses are toxic for the retina.
- Sterility should be maintained throughout the procedure.
- The injection site should be accurately determined using a caliper. Too anterior injection may result in hemorrhage. Too posterior injection may lead to retinal detachment.
- Tip of the needle should be pointed towards the center of the vitreous cavity.
- Tip of the needle should not be more than 1 to 1.25cm in the vitreous cavity.
- *Do not inject if you are unable to aspirate the vitreous. Instead, go for an AC tap and inject into the vitreous.*
- Inject slowly and steadily. Injection jet may damage the retina.



## **INOCULATION AND SUBMISSION FOR THE LAB WORKUP**

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- In some institutions, the Physician may have to do the inoculations and streaking onto the culture media. These include blood agar, Sabouraud's agar, chocolate agar, thioglycolate broth, or similar media.<sup>8</sup>
- One drop of the specimen should be placed on each of two clean slides for Gram and Giemsa stains for bacteria and fungi.
- Organisms visible after staining are predictive of positive cultures; negative stains are not predictive of negative cultures.

## **FOLLOW UP AND REPEAT INTRA VITREAL INJECTIONS**

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After the tap and inject the patient requires topical medications every hour and careful follow-up the next day. In many instances, this can be provided at home. Other individuals may have to be admitted to the hospital for care.

Moxifloxacin, Tobramycin, and Dexamethasone/ Prednisolone Eye drops may be used hourly. Fortified Tobramycin and Vancomycin eye drops are also used. A cycloplegic agent like Cyclopentolate appears better as compared to Atropin eye drops to keep the people mobile.

After intravitreal injection, the patient should be examined every day. Points that require special consideration include:

- vitreous activity,
- the degree of hypopyon,
- fundal glow.
- Close monitoring of IOP

Increasing or static vitreous activity indicates insufficient treatment. Injection should be repeated after 24-48 hours without hesitation if the response is not adequate. However, remember that all intravitreal injections carry their retinal toxicity and complications. Thus risk-benefit ratio must be



kept in mind while making a decision to repeat intravitreal injections.

## **PRESERVATION OF THE ANATOMICAL INTEGRITY IN EYES WITH NO VISUAL OUTCOME**

---

One of the limitations of EVS is that it excluded the eyes with NLP or significant opacification of A/C obscuring iris tissue. In our opinion, the anatomical integrity of the globe is an as important consideration, as restoration and preservation of the visual function itself. However, these patients do need more explanation, and they must be clear that treatment is being undertaken to preserve the shape of the eye only.

## **PROGNOSTIC SIGNS**

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### **GOOD PROGNOSTIC SIGNS**

- Improving visual acuity



- Decreasing hypopyon.
- Clearing anterior chamber.
- Decreasing corneal edema.
- Decreasing activity in vitreous.
- Improving fundal glow

### *Important*

*If vitreous activity or haze is increasing one should never be deceived by the clear anterior chamber or other signs.*

## POOR PROGNOSTIC SIGNS

- Deteriorating vision
- Increasing hypopyon
- Increasing cells and flare in AC
- Increasing corneal edema.
- Increasing vitreous activity or opacification
- Absent fundal glow.

*If the condition is static or is deteriorating, repeat intravitreal injection. If the condition is improving, shift to the topical treatment.*



## COMPLICATIONS OF THERAPY

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### INADEQUACIES

Improper technique may result in complications as already mentioned in precautions. The rate of complications approaches to almost nil if proper care is exercised. Especially important is that an injection should not be given if vitreous cannot be aspirated.

### RETINAL AND MACULAR TOXICITY

The infectious process itself and the treatment available both are toxic for the retina and the macula, but when the question is to save the eye, these factors should not be given excessive weightage. Anything less than evisceration and a phthisical eye should be considered an achievement. Many eyes have been saved using multiple injections and a post treatment vision of 6/6.

### OTHERS



We lose some eyes due to iatrogenic retinal detachment, perforation but mainly due to uncontrolled infection. Nothing can be said precisely about the cause in each case.

## PREVENTION OF ENDOPHTHALMITIS

---

Detailed discussion on prevention of endophthalmitis is beyond the scope of this booklet. Intracameral preparations of vancomycin, moxifloxacin, and cefuroxime have been used for prevention of endophthalmitis.<sup>9</sup> Injection cefuroxime is preferred by most of the ophthalmologists. There are random reports of toxic reactions to these preparations. Having no confidence on standardization of locally available commercial packs, the author has not used any such agent intracamerally.

Preoperative topical application of 5% Povidone Iodine has become a standard prophylaxis for cataract surgery. Povidone-iodine 5% is applied to the cornea, conjunctival sac and periocular skin for a minimum duration of three minutes before the surgery.<sup>10</sup>





# THE OUTCOMES AND CONCLUSION

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## THE OUTCOMES

In our study, we could achieve 6/6 to 6/24 vision in 30% of cases. 26% had 6/36 to 6/60. Anatomical integrity could be preserved in more than 90%.

As we consider the pros and cons and risk-benefit ratio, intravitreal injections and pars plana vitrectomy remains the only choice, by which we can hope some good results.

In the end, we want to mention the conclusion of the EVS. The presently available antibiotics given systemically, only lead to increased toxic effects, costs, and hospital stay, so they should better be avoided.<sup>6</sup> However, oral ciprofloxacin 500 mg BD may be used. For 5-7 days in the initial period.

## CONCLUSIONS

- One should have a high index of suspicion for endophthalmitis while examining the patients postoperatively.



## Treatment protocol for postoperative endophthalmitis.

- If one is unable to differentiate between bacterial and sterile endophthalmitis, the condition must be treated as bacterial endophthalmitis.
- Whenever endophthalmitis is suspected, immediate vitreous aspiration combined with intravitreal injection of antibiotics and steroids is recommended.
- The cornerstone of clinical diagnosis is VITREOUS activity and opacification, and the cornerstone of treatment is an optimum concentration of antibiotics inside the battlefield i.e. the VITREOUS.
- Tap and inject is the standard strategy for treatment of post-operative endophthalmitis.



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## POST TEST

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1. Which of the following measures has been shown to reduce the incidence of endophthalmitis following cataract surgery?
  - a. The addition of gentamicin to the intraocular irrigating solution during cataract surgery.
  - b. Instillation of 5% topical povidone-iodine during presurgical preparation of the eye
  - c. Treatment of blepharitis with hot compresses, lid hygiene, and antibiotic one week before cataract surgery
  - d. Keeping the eyelashes out of the field, using a plastic adhesive drape.
2. All of the followings are involved in endophthalmitis except?
  - a. Retina
  - b. Vitreous
  - c. Sclera
  - d. Uvea
3. Organism most commonly implicated in late onset endophthalmitis after cataract surgery is?



- a. *Pseudomonas aeruginosa*
  - b. *Staphylococcus epidermidis*
  - c. *Candida Albicans*
  - d. *Propionibacterium Acnes*
4. After 48 hours of a cataract extraction operation, a patient complained of ocular pain and visual loss. On examination, this eye looked red with ciliary injection, corneal edema, and absent red reflex. The first suspicion must be:
- a. Secondary glaucoma.
  - b. Anterior uveitis.
  - c. Bacterial endophthalmitis.
  - d. Acute conjunctivitis
5. Intravitreal injection may be performed in aphakic eyes:
- a. 4.5 mm posterior to the limbus
  - b. 3.5 mm posterior to the limbus
  - c. 5.5 mm posterior to the limbus
  - d. 2.5 mm posterior to the limbus



6. While entering the needle into the eye for vitreous aspiration and intravitreal injections, the tip of the needle is directed towards the:
  - a. Centre of the pupil
  - b. Centre of posterior capsule
  - c. Centre of the vitreous cavity
  - d. Centre of cornea
  
7. The volume of the intravitreal injection which can be injected without aspiration of the vitreous or AC tap is:
  - a. 0.05 ml
  - b. 0.15 ml
  - c. 0.25 ml
  - d. 0.35 ml
  
8. If indicated, the recommended vitrectomy procedure in acute endophthalmitis is:
  - a. Membrane peeling PPV
  - b. Cortical vitrectomy PPV
  - c. Anterior Vitrectomy PPV



- d. Core vitrectomy PPV
9. In eyes with endophthalmitis, having no perception of light:
- a. Regular protocol of endophthalmitis treatment may be followed to save the anatomical integrity
  - b. No intravitreal injection may be offered, and enucleation may be advised.
  - c. Evisceration of the intraocular contents is the only choice
  - d. Only topical treatment may be advisable as the visual outcome is highly guarded
10. In cases of endophthalmitis, the probability to find a microorganism is higher in:
- a. Aqueous Samples
  - b. Tear lake samples
  - c. Corneal samples
  - d. Vitreous samples

## POSTTEST RESPONSE SHEET





Treatment protocol for postoperative endophthalmitis.

1	2	3	4	5
6	7	8	9	10



## TEST ANSWERS WITH EXPLANATIONS

---

### 1. **ANSWER: "B"**

The organisms responsible for 80% to 90% of postoperative endophthalmitis are Gram-positive organisms commonly found on the patient's own lids. Isolation of the meibomian gland orifices and lashes is best accomplished with the use of a plastic adhesive drape. However, of the measures listed only the application of 5% povidone iodine in the conjunctival sac has been shown to reduce the incidence of postoperative endophthalmitis.

### 2. **ANSWER: "C"**

Sclera. Endophthalmitis by definition is the inflammation of cavities of the eye. Thus it does not involve the scleral coat. Whereas in panophthalmitis both the coats and cavities are involved.

### 3. **ANSWER: "D"**



*Propionibacterium Acnes* is the culprit in most of these cases. Fungi also appear late but a rare diagnosis.

**4. ANSWER: "C"**

The clinician needs to examine the post-operative cataract patients with a high index of suspicion. Endophthalmitis may be a top suspect in any eye with inflammation greater than the usual post-operative course.

**5. ANSWER: "B"**

The recommended site for intravitreal injection in aphakic is 3.5 mm posterior to the limbus. In phakic patients, the injections are made 4.00 mm to avoid damage to the crystalline lens. Too anterior injections may involve highly vascular pars plicata, and too posterior injections may result in retinal complications.

**6. ANSWER: "C"**

The tip of the needle is directed towards the center of the vitreous cavity. The needle may damage the crystalline lens or posterior capsule if the entry is made parallel to the iris.

**7. ANSWER: "A"**



The recommended volume for intravitreal injection without aspiration is 0.05 ml only. The higher volumes may lead to the marked rise in IOP. It is to be stressed further that monitoring the pre and post procedure IOP is also mandatory.

**8. ANSWER: "D"**

Core pars plana vitrectomy is the procedure of choice in acute endophthalmitis. The fragility of the inflamed retina and intraocular tissues may result in complications like retinal breaks and bleeding. The thorough cortical clearance may be undertaken as a secondary procedure later on.

**9. ANSWER: "A"**

Regular protocol of endophthalmitis treatment may be followed. The anatomical integrity of the globe is an as important consideration, as restoration and preservation of the visual function itself. However, these patients do need more explanation, and they must be clear that treatment is being undertaken just preserve the shape of the eye.

**10. ANSWER: "D"**



Treatment protocol for postoperative endophthalmitis.

The probability of finding a microorganism is indeed higher in the vitreous as compared to the aqueous humor.

# 2016 TREATMENT PROTOCOL

For Postoperative Endophthalmitis

Concise guidelines

2<sup>nd</sup> Edition



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